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Enhanced Activity of ZnO with Addition of C_3N_4 For Photocatalytic Removal of Phenol under Visible Light

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Phenol is a stable and hazardous compoundthat is commonly found as an industrial effluent[1]. Phenol can be treated by photocatalysis using ZnO as a photocatalyst[2, 3]. Unfortunately, the use of zinc oxide (ZnO) in photocatalysis is limited due to the photocorrosion effect and poor response to the visible light[4]. Various methods have been reported to improve the performance of ZnO,such as the use of carbon nitride (C_3N_4) to suppress the photocorrosion and improve the absorption in the visible light region[5]. It was reported that the ZnO-C_3N_4could be prepared by mixing the powder ZnO with C_3N_4that was dispersed in methanol, followed by drying process under nitrogen atmosphere[5]. In the present study, a series of ZnO-$C_3N_4$was prepared bya simplermethod, which was impregnationof zinc oxide precursor on the C_3N_4, followed by calcination process. The effect of zinc to carbon ratio (Zn/C) on the properties and photocatalytic activity was examined.XRD patterns of the samples revealed that as the Zn/C ratio increased, the intensity of diffraction peaks for ZnO also increased but the intensity for C_3N_4 decreased. All the prepared composite materials have an extended absorption band in the visible light region due to the presence of C_3N_4, as supported by DR-UV Vis spectra. The prepared ZnO-C_3N_4 composites were further investigated in the photocatalytic removal of phenol under visible light irradiation for 5 hours. All ZnO-C_3N_4 samples showed higher activity than the bare ZnO (Figure 1). The ZnO-C_3N_4 with Zn/C ratio of 1 mol% showed the highest photocatalytic activity for removal of phenol among all the samples. The high activity observed on the ZnO-C_3N_4 would be due to the role of C_3N_4 to suppress electron-hole recombination and extend the absorption of ZnO in the visible light region.

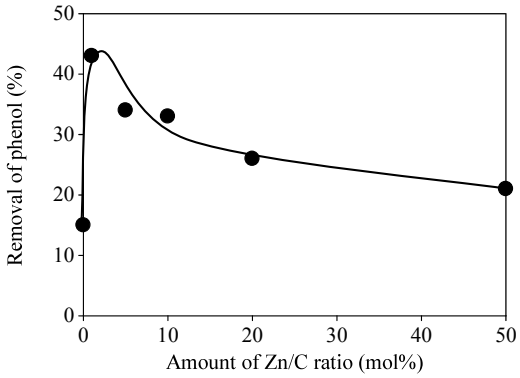

Figure 1 Photocatalytic activity of ZnO-C_3N_4composites with various amounts of Zn/C ratio

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